

ARITHMETIC MADE EASY, 3

IN THE
FIRST FOUR
FUNDAMENTAL RULES,
WITH AN APPENDIX OF REDUCTION
AND THE
SINGLE RULE OF THREE.

ALSO A COLLECTION OF
ALL THE USEFUL TABLES.

Submitted to the earliest and least informed Capabilities, and principally designed to revive the neglected, but useful Exercises of that Science.

To which are added for Illustration,

EXAMPLES AND PROOFS
UNDER EVERY RULE;

ALSO

For Exercise) many Examples and their Answers
under every Case in Reduction and the Rule of
Three.

UPON AN INTIRE NEW PLAN.
BY J. BETTESWORTH;

Mathematical Master to the Maritime School, Chelsea.

L O N D O N :

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11X

ARITHMETIC MADE EASY
IN THE
FIRST BOOK
FUNDAMENTAL RULES
WITH AN ALPHABET OF REBUS
AND TWO
SINGLE RULES OF THREE
A SECOND COLLECTION OF
ALL THE USEFUL TABLES

Exposition to the student and full instruction of the
same, and particularly designed to assist the
beginner, but also of great use to the advanced
student in the study of the subject.

THE FIRST AND SECOND
BOOKS
ALSO
A TABLE of the
Weights and Measures used in England
and every other Part of the World
Three

BY AN ANTIQUE NEW PLAN
BY J. BETTERIDGE
The method of writing is the same as that of the

LONDON
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in the Strand, near St. Martin's Church.

THE END OF THE SECOND BOOK

P R E F A C E.

GR E A T as our improvements have been in all arts and sciences, for a century past in England, it is however a fact no less strange than true, that many persons are to be found, not only in the more remote and uncultivated parts of the kingdom, but even in this metropolis, notwithstanding all its boasted pre-eminence in commercial knowledge, who are extremely deficient in the simple rudiments of Arithmetical knowledge.— This defect must necessarily arise either from indolence and inattention in youth,

iv P R E F A C E.

youth, when at school, or, which is more frequently the case, from the want of opportunity and practice in riper years. Hence proceed inconveniencies, difficulties, and losses to numbers in various occurrences of life.

To remedy all this, I was induced some time ago, to publish a short treatise on the Four First Fundamental Rules of Arithmetic. The very favorable reception that compendious essay met with from the Public, and the particular notice taken of its utility by the reviewers, encouraged me to enlarge my plan, which I have done on the same principle, still adhering to my first idea, that the more plain and simple the terms used in explaining such rules are, the better

P R E F A C E.

better adapted they must be to convey instruction to those capacities for which they are chiefly designed, the young and inexperienced. I flatter myself, that the additions made to the former plan will prove satisfactory, as the little work, in the state in which it now appears, will be found to comprehend every thing necessary to inform the judgment, though entirely uncultivated, as well as to refresh and strengthen the memory of those who may have made it a study at school, but who may be now grown less expert from neglect or want of opportunity, as it will furnish every attentive mind with the principles and means of becoming the most ready and accurate accomptant in the first four fundamental

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mental rules of Arithmetic, as also in *Reduction* and the *Rule of Three*, even without any personal assistance whatsoever. The utility of this little work to every one who may be any way deficient in such knowledge, must be obvious; I therefore persuade myself that no such person will be without it, as by a few hours studious revival they may become perfect adepts in this branch of necessary knowledge.

To conclude, the subject is confined to so narrow a compass for the conveniency of being portable, and that it might be afforded at so low a price as to put it in the power of every one, from the school-boy to the tradesman, to make an easy purchase. Let it be farther observed,
that

P R E F A C E. vii

that the youth of both sexes destroy several books of much greater value before they have acquired competent ideas of the matter contained in this compendious treatise. And it is a notorious fact likewise, that very few, if any, of the female sex are so perfectly conversant with Arithmetic as to be above deriving any benefit from this work.

2 Hundreds of Millions
 7 Tens of Millions
 5 Millions
 6 Hundreds of Thousands
 3 Tens of Thousands
 7 Hundreds
 7 Tens
 3 Units

Numeration Table.

4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
Make 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

The Multiplication Table.

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

ARITHMETIC MADE EASY.

ON ARITHMETIC.

Q. WHAT is Arithmetic?

A. The art of computation by numbers or figures.

Q. What does Arithmetic teach you?

A. To find the quantity, value and proportion of things.

Q. How is it performed?

A. By the use of the ten following characters or figures, viz. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Q. What are the principle rules in order to obtain a thorough knowledge of Arithmetic?

A. Numeration, Addition, Subtraction, Multiplication and Division, for it is impossible to perform any operations in
Arithmetic

Arithmetic without the use of one or more of them.

OF NUMERATION.

This teacheth to read or write numbers or figures; in performing of which observe well, that all characters, or figures more than *three* to *six* are so many thousands, and from *six* to *nine* so many millions, &c.

EXAMPLES.

Write in words 27.

A. Twenty seven.

Ditto 240.

A. Two hundred and forty.

Ditto 4017.

A. Four thousand and seventeen.

Ditto 30710.

A. Thirty thousand seven hundred and ten.

Ditto 103071.

A. One thousand three hundred and seventy-one.

Write

M A D E E A S Y. 11

Write in words 5073205.

A. Five millions, seventy-three thousand,
two hundred and five.

Ditto, 49210076.

A. Forty-nine millions, two hundred,
and ten thousand and seventy six.

Ditto, 610019204.

A. Six hundred, ten millions, nineteen
thousand, two hundred and four.

Express in figures ninety-two?

A. 92.

Ditto, Two hundred and ten:

A. 210.

Ditto, Three thousand and five.

A. 3005.

Ditto, Twenty one thousand, two hun-
dred and seventeen.

A. 21217.

Ditto, Nine hundred, two thousand, four
hundred and seven.

A. 992407.

Ditto, Seven millions, four hundred
seventeen thousand and thirteen.

A. 7417013.

Express

Express in figures Thirty-five millions,
sixteen thousand two hundred and forty.

A. 35016240.

Ditto, Eight hundred seven millions,
two hundred ten thousand and nineteen.

A. 807210019.

ARITHMETICAL CHARACTERS EXPLAINED.

+ Addition.

— Subtraction.

× Multiplication.

÷ Division.

= Equality or equal.

∴ Is to or to As 2 ∴ 4 ∴ 6 ∴ 12

that is

∴ So is

As 2 is to 4 so is 6 to 12

EXAMPLE.

$$50 + 50 = 100 - 20 = 80 \times 3 = 240 \div 6 = 40$$

That is

50 added to 50 is equal to 100, sub-
tract 20 therefrom it will then be equal

to

to 80 which multiply by 3 is equal to 240, this divided by 6 is equal to 40, as expressed by characters in page 12.

SIMPLE ADDITION.

Teacheth to add two or more sums together, to make one whole or total sum.

R U L E.

Place units under units, tens under tens, &c. and when you have cast up a line, consider how many tens are in it, and as many as there are, so many must be added to the next line, and the overplus (if any) put down exactly under the line added up; if none be over, place a cypher, and in the last line put down all it comes to; but should any line added up not be so many as 10, set it down underneath that line and carry none.

P R O O F.

Vary the adding by beginning at the top of the sum, and count the figures downwards in like manner as you did

B

upwards,

wards, and should the sum come to the same as before it is supposed to be right; this is the best method of proving addition.

EXAMPLES.

Plumbs.

2746

5769

2978

4783

2958

 19234

Pears.

509274

370629

709684

276847

729083

 2595517

Boys.

4971

9776

4967

2948

7746

 30408

Girls.

407627

972063

740657

297048

972706

 3390101

COMPOUND ADDITION OF MONEY.

RULE.

Place pounds under pounds, shillings under shillings, &c. add up the farthings and

and find how many pence they make, so many you carry to the pence, the overplus (if any) place under the farthings (this must be observed in placing the overplus under the pence and shillings also) then add up the pence, and find how many shillings, the number of which must be carried to the shillings, and in like manner add up the shillings, and find how many pounds, and carry the pounds to the pounds, and add as in Simple Addition.

EXAMPLES.

L.	S.	D.	L.	S.	D.
74	17	6	42	14	6
42	15	7	27	19	8
37	19	11	59	17	7
91	18	9	25	18	11
72	16	10	76	16	10
320	8	7	233	7	6

3			4		
L.	s.	D.	L.	s.	D.
746	17	$6\frac{1}{2}$	627	13	$6\frac{1}{2}$
475	18	$9\frac{3}{4}$	74	19	6
754	16	$11\frac{1}{4}$	9	17	$11\frac{3}{4}$
275	19	$6\frac{1}{2}$	47	18	$7\frac{1}{4}$
297	10	$0\frac{3}{4}$	314	10	$6\frac{1}{2}$
2551	2	$10\frac{3}{4}$	1075	0	2

The work to example 3 and 4.

F.	D.	F.	D.
11=2	$\frac{3}{4}$	8=2	—
d. s. d.		d. s. d.	
34=2	10.	38=3	2
s. l. s.		l. s.	
82=4	2	80=4	0
31		35	
35		17	
25		10	

SIMPLE SUBTRACTION.

Teacheth to take a less number from a greater, and shews the remainder or difference.

RULE

MADE EASY. 17

RULE.

Begin at the right hand to take the lower figure from the upper, but should the lower figure be greater than the upper, borrow 10 which add to the upper figure, and then subtract, and pay it by carrying one to the next figure, and so proceed through the whole.

PROOF.

Add the remainder to the lesser number, and if that sum be like the greater, the work is right.

EXAMPLES.

From 47160246
Take 21747624

Rem. 25412622

Proof 47160246

From 400207
Take 209598

Rem. 190609

Proof. 400207

COM-

COMPOUND SUBTRACTION OF MONEY.

R U L E.

When the lower number is greater than the top, if in farthings borrow 4, which add to the farthings and then subtract; in pence borrow 12, and in shillings 20; then work the pounds as simple subtraction; but do not forget to carry 1 to the next number whenever you borrow.

EXAMPLES.

	L.	S.	D.
From	746	17	4 $\frac{1}{4}$
Take	247	13	7 $\frac{1}{4}$
Rem.	499	3	8 $\frac{1}{4}$

Proof	746	17	4 $\frac{1}{4}$
-------	-----	----	-----------------

	L.	S.	D.
From	374	11	3 $\frac{1}{4}$
Take	219	11	6 $\frac{1}{4}$
Rem.	154	19	8 $\frac{1}{4}$

Proof	174	11	3 $\frac{1}{4}$
-------	-----	----	-----------------

S I M.

SIMPLE MULTIPLICATION.

Compendiously performs the office of many additions, to this rule belong three principal members, viz.

1. The Multiplicand, or number to be multiplied.
2. The Multiplier, or number by which you multiply.
3. The Product, or number produced by multiplying.

R U L E.

Take care to place the first figure of every line exactly under its multiplier, and as you multiply carry 1 for every 10; should there be any cyphers at the end (or otherwise) in the multiplier, they must be placed in exact order cypher under cypher, as they stand. When the whole of the multiplication is performed, and your multiplier consists of more than one line, you must add it up as Simple Addition.

PROOF.

P R O O F.

Make the multiplicand the multiplier, and if the product comes out the same as before, the work is right: Some masters teach to prove multiplication by the cross, it is by no means to be depended upon; to prove it by division is best.

EXAMPLES.

$$\begin{array}{r} 275463819 \\ 5 \\ \hline \end{array}$$

$$\hline 1377319095$$

$$\begin{array}{r} 726395418 \\ 70 \\ \hline \end{array}$$

$$\hline 50847679260$$

547296318 multiplicand.

40250 multiplier.

$$\hline 27364815900$$

$$1094592636$$

$$21891852720$$

$$\hline 22028676799500 \text{ product.}$$

C O M-

COMPOUND MULTIPLICATION OF
MONEY.

R U L E.

Multiply the farthings and find how many pence they make, which number carry to the pence; the overplus (if any) set down under your farthings; then multiply the pence and find how many shillings they make, the number of which must be carried to the shillings and the overplus placed under the pence; in like manner multiply your shillings and find how many pounds, and carry the pounds to the pounds, then multiply the pounds as Simple Multiplication.

EXAMPLES.

EXAMPLES.

L.	S.	D.	L.	S.	D.
574	17	$6\frac{1}{4}$	429	16	$8\frac{3}{4}$
		3			6
1724	12	$6\frac{1}{2}$	2579	0	$4\frac{1}{2}$

The work to example 1 and 2.

qrs. d.

$$3 = 0\frac{3}{4}$$

d. s. d.

$$18 \quad 1 \quad 6$$

s. l. s.

$$52 \quad 2 \quad 12$$

$$14$$

$$22$$

$$17$$

d.

$$18 = 4\frac{1}{2}$$

d. s. d.

$$52 = 4 \quad 4$$

l. s.

$$100 = 5 \quad 0$$

$$59$$

$$17$$

$$25$$

N. B. When the multiplier exceeds 12.

RULE.

Multiply by numbers, which when multiplied into each other make the multiplier, or as near as possible, and add or subtract as occasion requires; let it be required to multiply 4l. 17s. $6\frac{1}{4}$ d. by 25, in this case you must multiply 4l. 17s. $6\frac{1}{4}$ d. by 5, and that product by 5 again, for example.

MADE EASY.

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L. S. D.

Multiply 4 17 $6\frac{1}{2}$ by 25

$$5 \times 5 = 25$$

24 7 $8\frac{1}{2}$

5

121 18 $6\frac{1}{2}$

Multiply 3 17 $8\frac{1}{4}$ by 31

$$6 \times 5 + 1 = 31$$

23 6 $1\frac{1}{2}$

5

116 10 $7\frac{1}{2}$

3 17 $8\frac{1}{4} + 1$

120 8 $3\frac{1}{2}$

Multiply 2 13 $7\frac{1}{2}$ by 83

$$12 \times 7 - 1 = 83$$

32 3 9 -

7

225 6 3 -

2 13 $7\frac{1}{2} - 1$

222 12 $7\frac{1}{2}$

ARITHMETIC

SIMPLE DIVISION.

Teacheth to find how often one number is contained in another, or to divide any number into what parts you please.

N. B. In this rule there are three numbers real, and a fourth accidental, viz.

1. The Dividend, or number to be divided.

2. The Divisor, or number by which you divide.

3. The Quotient, or number that shews how often the divisor is contained in the dividend.

4. The Accidental number, is what remains when the work is finished, and is always of the same name as the dividend.

CASE I.

When the divisor is not greater than 12.

R U L E.

Find how often it is contained in the first figure of the dividend, but should it be

be less than the divisor, take the product of the first two figures (or more if need be) and find how often it is contained in them, set it down under the figure or figures divided, and carry the overplus (if any) to the next figure in the dividend as so many tens; but should nothing remain, and the next figure in the dividend be less than the divisor, be sure to put a cypher under that figure in the dividend and proceed as before; then find how often the divisor is contained therein, set it down and do the same till you have gone through the whole.

N. B. If there is a cypher or cyphers at the end of the divisor, cut them off and a like number of figures from the right hand of the dividend, which (if not cyphers) must be considered as part of the remainder; this is called short division.

P R O O F.

Multiply the quotient by the divisor, adding in the remainder (if any) or add

C

the

the whole remainder to the product at last, and if it comes the same as the dividend the work is right.

EXAMPLE.

Divisor 5) 74750467 Dividend

Quotient 14950093--2 Remainder
5

74750467 Proof

Divisor 5(0) 4038179(1 Dividend

Quotient 807635--41 Rem.
50

40381791 Proof

CASE II.

When the divisor is greater or more than 12.

RULE.

See how often the first figure of the divisor is contained in the first figure of the dividend, or should the first figure in the dividend

vidend be less than that in the divisor, take the product of the first two figures in the dividend, and see how often in them; then put it in the quotient, by which multiply the divisor, and place the product under the dividend (allowing as many figures as there are in your divisor, and one more if the first figure in the dividend be less than the first figure in the divisor) draw a line underneath it, subtract it therefrom, and to the remainder annex the following figure of the dividend; and should that new dividend be less than the divisor, put a cypher in the quotient and annex the following figure of the whole dividend, then proceed as before: ever observing, that every new product be less than the new dividend, and the remainder be not so great as the divisor; for if it is, you may be assured it will go more; this is called long division.

EXAMPLES

EXAMPLES.

$$\begin{array}{r} \text{divisor} \quad \text{dividend} \quad \text{quotient} \\ 24 \overline{) 21716421} \quad (904850 \\ \underline{216} \quad \quad \quad 24 \end{array}$$

116	3619400
96	1809700

204 21716400
192 21

122 21716421 proof.
120

rem: 21

793) 7192657 (9047
X-1113 7153 795

3765 45235
3180 81423

63329

5857
5565 7192365
292

rem. 292

7192637 proof

COM-

MADE EASY.

COMPOUND DIVISION OF MONEY.

Work the pounds as simple division; but what may be over (if any) multiply by 20 and add in the shillings, then divide as before; the over shillings multiply by 12 and add in the pence; and the over pence multiply by 4 and add in the farthings.

EXAMPLES.

First Example.

	L.	S.	D.
5)	475	15	$5\frac{1}{2}$
	95	3	$1-2$
			5
Proof	475	15	$5\frac{1}{2}$

Second Example.

	L.	S.	D.
6)	82	18	$9\frac{3}{4}$
	13	16	$5\frac{1}{2}-3$
			6
of	82	18	$9\frac{3}{4}$

Example 2d worked.

4
20
80
18
6)98
S.
16--2
12
24
9
6)33
D.
5-3
4
12
3
6)15
2-3

T H E
A P P E N D I X.

R E D U C T I O N

Brings quantities from one denomination to another, still keeping or retaining the same value.

C A S E I.

Great names are brought to small by multiplying, small to great by dividing, observing always to multiply or divide by as many of the less as make one of the greater; however, it is most usual to multiply or divide step by step; for if pounds are to be brought to farthings, bring the pounds first to shillings, then the shillings to pence, and the pence to farthings.

EXAMPLES.

APPENDIX.

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EXAMPLES.

In 52 pounds, how many farthings?

52 pounds

20

1040 shillings

12

12480 pence

4

Answer. 49920 farthings.

In 49920 farthings, how many pounds?

4)49920

12)12480 pence

20)1040 shillings

Answer. 52 pounds.

N. B. The two examples might have been worked thus.

In 52 pounds how many farthings?

52 pounds

960

3120

468

Answer. 49920 farthings.

In 49920 farthings, how many pounds?

$$\begin{array}{r}
 \text{Q.} \quad 4992,0 \quad \text{L.} \\
 96,0) \quad 4992,0 \quad (52 \\
 \underline{480} \\
 192 \\
 \underline{192} \text{ Answer } 52 \text{ pounds.}
 \end{array}$$

In 131. how many shillings, pence and farthings?

A. 260 shillings, 3120 pence, 12480 farthings.

How many farthings are there in 72 guineas?

A. 72576 farthings.

In 19 crowns, how many shillings and three-pences?

A. 95 shillings, 380 three pences.

Reduce 15 guineas to shillings and pence?

A. 315 shillings, 3780 pence.

How

How many half-crowns are there in 75 pounds?

A. 600 half-crowns.

Reduce 21 half-guineas to six-pences and two-pences.

A. 441 sixpences, 1323 two-pences.

In 474680 farthings, how many pounds?

A. 494 pounds, 9 shillings and 2 pence.

In 84960 pence, how many guineas?

A. 337 guineas and 3 shillings.

How many crowns are there in 8470 shillings?

A. 1694 crowns.

How many guineas are there in 57192 six-pences?

A. 1361 guineas and 15 shillings.

In 58760 farthings, how many pence, half-crowns and guineas?

A. 14690 pence, 489 half-crowns, 58 guineas, 6 shillings and 2 pence over.

In 400 three-pences, how many shillings, crowns and pounds?

A. 100 shillings, 20 crowns, and 5l.

C A S E II.

When a compound number is required to be brought to its lowest denomination.

R U L E.

As you multiply add to it what may be of the next lowest name; for instance, let it be required to find how many farthings there are in 5 pounds, 17 shillings and 6 pence half-penny: to perform this multiply the pounds by 20 and add to it 17, that will produce the shillings in 5l. 17s. then multiply the shillings in 5l. 17. by 12, and add in 6 which will produce the pence in 5l. 17l. 6d. lastly multiply the pence in 5l. 17s. 6d. by 4, and add in 2, it will then produce the farthings in 5l. 17s. 6d. $\frac{1}{2}$ as required.

APPENDIX.

35

EXAMPLES.

In 5l. 17 6d $\frac{1}{2}$. how many farthings?

L. S. D.

5 17 6 $\frac{1}{2}$

20

— L. S.

117 shillings in 5. 17

12

— L. S. D.

1410 pence in 5 17 6

4

— L. S. D.

Answer. 5642 farthings in 5. 17. 6 $\frac{1}{2}$.

tons. hhd. galls. pints.

In 5 2 16 7 of wine, how many pints?

4

—

tons hhd.

202 hogheads in 50 2

63

—

622

1212

—

tons hod gall

12742 gallons in 50 2 16

8

—

tons hhd gall pints

101943 pints in 50 2 2 16

APPENDIX.

In 21l. 13s. 7d. $\frac{1}{2}$ how many farthings?

A. 20815 farthings.

In 36l. 0s. 9d. how many shillings and pence?

A. 720 shillings 8640 pence.

Reduce 25 guineas and a crown, to shillings and pence.

A. 530 shillings, 6360 pence.

Bring 22 pounds and a half-guinea to farthings.

A. 21624 farthings.

How many pence are there in 15 guineas and a half?

A. 3906 pence.

How many farthings are there in nineteen guineas, seventeen pounds and thirteen half-guineas.

A. 42024 farthings.

CASE III.

When one number is required to be divided by another.

RULE.

CASE III.

When one number is required to be divided by another.

RULE.

Bring the two numbers to one name, and divide one by the other.

EXAMPLES.

In 560 guineas, how many pieces, each 6s. 8d?

G.	6s. 8d.
560	12
21	—
—	80 pence
560	—
1120	—
—	—
11760	shillings
12	—
—	—
8,0314112,0	pence
—	—
1764.	A. 1764 pieces.

D

How

How many pieces, each 36 shillings, are there in 176 guineas?

176 guineas

21

176

352

36)3696(102

36

96

72 A. 102 pieces and 24s. over.

24

In 36 pounds, how many guineas?

A. 34 guineas, 6 shillings.

In 72 guineas, how many pounds?

A. 75 pounds, 12 shillings.

In 21 guineas, how many crowns?

A. 88 crowns, 1 shilling.

In 84 Crowns, how many guineas?

A. 20 guineas.

In 472 pounds, how many pieces, each 4 shillings and 6 pence?

A. 2097 pieces, 3 shillings and 6 pence over.

In 436 pieces, each 6 shillings and 8d.
how many crowns?

A. 581 crowns, and 1 shilling 8 pence over.

CASE IV.

To find in any sum, quantity, &c. an equal number of each of many inferior denominations.

RULE.

Add together the whole of the inferior names, and make their sum a divisor to such a sum, quantity, &c. then proceed as in Case 3d.

EXAMPLES.

In 56 guineas, how many half guineas, crowns & shillings, of each an equal number?

56	S. D.
21	10 6 half-guinea
56	5 0 a crown
56	2 6 half-crown
112	1 0 a shilling

19) 1176 (61 19 0
114
36
19 A. 61 of each, and 17s. over.
17

In a pipe of wine, how many gallons, quarts, pints and half-pints, of each an equal number?

G.	Q.	P.	$\frac{1}{2}$ P.
126	1	pipe	
8			
1008		pints	
2			
23)2016(87			
184			
176	5	quarts	
161	2		
15	11	pints	
	2		
	23	half-pints	

A. 87 of each, and 15 half-pints over.

A merchant having 123 ingots of silver, each 5lb. 11 $\frac{1}{2}$ oz. and 26 wedges, each 2lb. 6oz. 1 $\frac{1}{2}$ dwt., would have the whole cast into

APPENDIX.

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into an equal number of tankards of $11\frac{1}{2}$ ounces, cups of $6\frac{1}{2}$ oz. candlesticks of $8\frac{3}{4}$, spoons of 5oz. 6dwts. what was the number of each?

A. 298 of each, and 511dwts over.

What equal number of shirts of $3\frac{1}{2}$ yards, shifts of $4\frac{1}{4}$ ells Flemish, aprons of $1\frac{1}{4}$ ells English, may be made out of 12 pieces of Holland, each $27\frac{1}{4}$ yards?

A. 40 of each.

In 27 large vessels, each 318 gallons and 56 pipes of wine, what equal number of casks of 21 gallons 7 pints, 18 gallons 4 pints, 16 gallons 2 pints, 14 gallons 7 pints, and 13 gallons 5 pints?

A. 183 of each, and 64 gallons and 1 pint remaining.

OF WEIGHTS AND MEASURES.

24 grains make 1 pennyweight, $\frac{5}{16}$ of a marked $\frac{1}{2}$ dwt

20 pennyweights 1 ounce (oz.)

12 ounces 1 pound (lb.)

By this weight are weighed gold, silver, jewels and precious stones.

In 25 pounds of gold, how many grains?

A. 144000 grains.

Bring 412128 grains of gold into pounds.

A. 71lb. 6oz. 12dwts.

In 75 ingots of gold, each 3lb. 6½ oz. how many pennyweights?

A. 63750 pennyweights.

How many medals, each 1oz. 16dwts. 12grs. may be made out of 27 wedges of gold, each 3½ pounds?

A. 621 medals and 324 grains over.

AVOIRDUPOIS WEIGHT.

16 drachms make 1 ounce, marked (dr.)

16 ounces 1 pound (oz.)

16 pounds 1 hundredweight (lb.)

APPENDIX.

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28 pounds 1 quarter (qr)

4 quarters, or 112 lb. 1 hundred (cwt)

20 hundreds 1 ton (ton)

By this weight are weighed any thing of a coarse or drossy nature; as all grocery, chandlery wares, &c. all metals, (gold and silver excepted.)

Reduce 70 tons, 12cwt. 3qrs. of cordage into pounds?

A. 158228 pounds.

In 158228 pounds of cordage, how many tons?

A. 70 tons. 12cwt. 3qrs.

Change 81 bars of iron, each $2\frac{1}{2}$ cwt into ounces?

A. 326592 ounces.

In 24 bags of hops, each $16\frac{1}{2}$ cwt. what equal number of pockets of 1 cwt. 1 qr.

17 lb. of 1cwt. 1qr. 19lb. of $2\frac{1}{4}$ cwt. and of 2cwt. 2qr. 19lb.?

A. 51 of each and 135 pounds over.

APOTHECARIES WEIGHT.

20 grains make 1 scruple, marked (gr)

3 scruples 1 drachm (3)

18 drachms 1 ounce (3)

16 ounces 1 pound (lb)

By this weight the apothecaries compound their medicines; but buy their drugs by avoirdupois.

Reduce 21 lb. 7 3/4 into grains?

A. 21460 grains.

Bring 21460 grains into ounces.

A. 443, 53, 29.

In seven pounds of compounds, how many papers each 13, 29?

A. 403 papers and 19 over.

In 3 lb, 63, 75 of compounds, what equal number of pills of 13, 19, of 13, 10 grains and bolusses of 53, 29?

A. 42 of each.

CLOTH MEASURE.

2 $\frac{1}{4}$ inches make	1 nail marked	(ul)
4 nails	1 quarter of ayd.	(qr)
4 quarters	1 yard	(yd)
3 quarters	1 Flemish ell	(E.F.)
5 quarters	1 English ell	(E.E.)
6 quarters	1 French ell	(E.Fr.)

Bring 165 yards and 3 quarters into nails?

A. 2652 nails.

In 3710 nails, how many yards?

A. 231 yards, 3 quarter and 2 nails?

Reduce 25 bails of cloth, each 42 pieces, each 28 $\frac{1}{4}$ ells Flemish into nails?

A. 359100 nails.

How many shirts each 3 ells English may be made out of 5 pieces of cloth, each 22 $\frac{1}{4}$ yards?

A. 30 shirts.

CLOTH

LONG MEASURE.

3 barley corns make	1 inch marked.	(<i>bar</i>) (<i>in</i>)
12 inches	1 foot	(<i>ft</i>)
3 feet	1 yard	(<i>yd</i>)
6 feet or 2 yards	1 fathom	
5½ yards	1 rod, po. or p.	(<i>r.p.</i>)
40 poles	1 furlong	(<i>fur</i>)
8 furlongs or 1760 yds	1 mile	(<i>mile</i>)
3 miles	1 league	(<i>lea</i>)
60 miles or 20 leag.	1 degree	(<i>deg</i>)

This measure is used to measure distance of places, or any thing else, where length only is considered.

N. B. A degree is 69 miles, 4 furlongs nearly though commonly reckoned 60 miles.

In 1468 yards, how many inches?

A. 52848 inches.

In 31 miles 29 fathoms, how many yards?

A. 54618 yards.

Bring 13685760 barley corns into miles.

A. 72 miles.

How

How many times will a coach-wheel of 15 feet $7\frac{1}{2}$ inches in circumference turn about its axis, it being drawn 85 miles?

A. 28723 times and $37\frac{1}{2}$ inches over.

WINE MEASURE.

2 pints make	1 quart marked	(pts)
8 pints or 4 quarts	1 gallon	(gal)
10 gallons	1 anchor of bdy	(anc)
18 gallons	1 runlet	(run)
$31\frac{1}{2}$ gallons	half an hhd	($\frac{1}{2}$ hhd)
42 gallons	1 tierce	(ti)
63 gallons	1 hoghead	(hhd)
84 gallons	1 puncheon	(p)
2 hogheads	1 pipe or butt	(p or b)
2 pipes or 4 hhds	1 tun	(tun)

All brandies, spirits, perry, cyder, mead, vinegar, honey and oil, are measured by this measure, also milk.

Reduce 42 tuns, 2 hogheads and 6 gallons of wine into pints?

A. 85808 pints.

Bring

Bring 47512 pints of wine into tuns.

A. 23 tuns, 2 hogheads and 17 gallons.

In 2723 pints, 670 gallons and 52 hogheads of Lisbon, how many tuns?

A. 17 tuns 2 gallons, and 3 pints.

In 512 hogheads of Port wine, how many small casks of each 27 $\frac{1}{4}$ gallons?

A. 1172 casks and 26 gallons over.

BEER AND ALE MEASURE.

2 pints make	1 quart marked	(qt)
8 pints or 4 quarts	1 gallon	(gal)
8 gallons	1 firkin of ale	(a. fi)
9 gallons	1 firkin of beer	(b. fi)
32 gallons	1 barrel of ale	(bar. a)
36 gallons	1 barrel of beer	(bar. b)
2 firkins	1 kilderkin	(kil)
2 kildks or 4 fir.	1 barrel	(bar)
1 $\frac{1}{2}$ barr. or 54 gals.	1 hhd. of beer	(bd. b)
1 $\frac{1}{2}$ barrel or 48 gals.	1 hhd. of ale	(bd. a)
3 barrels or 2 hhds.	1 butt	(butt)
2 butts or 4 hhds.	1 tun	(ton)

In

In 51 hogheads, 18 gallons, 1 quart, and 1 pint of beer how, many pints?

A. 22179 pints.

Bring 22179 pints of beer into hogheads.

A. 51 hogheads, 18 gallons, 1 quart, and 1 pint.

In 74 hogheads of ale, how many barrels?

A. 111 barrels.

A brewer having casks of 3 sizes (viz.) of 16 gallons, 12 gallons, and 8 gallons, ordered his foreman to fill an equal number of each out of a large tub containing 5 tons, 1 hoghead and 18 gallons of beer; what was the number filled?

A. 32 of each.

DRY MEASURE.

OF CORN.

2 pints	makes	1 quart marked	$\left\{ \begin{array}{l} pts \\ qur \end{array} \right\}$
2 quarts or 4 pints		1 pottle	(pot)
2 pottles		1 gallon	(gal)
		E	2 gallons

2 gallons make	1 peck	marked	(pk)
4 pecks or 8 gals.	1 bushel	—	(bu)
4 bushels	1 sack	—	(sk)
2 sacks or 8 bush.	1 quarter	—	(qr)
5 quars. 10 sacks or 40 Bushels	} 1 load	—	(ld)

OF COALS.

2 gallons	—	1 peck	—	(gal)
				(pk)
4 pecks or 8 gals.	1 bushel	—		(bu)
3 bushels	—	1 sack	—	(sk)
9 bushels	—	1 vat or strike	—	(vat str)
27 bushels	—	1 load	—	(ld)
36 bush or 12 sac.	1 chaldron	—		(chal)
5 chaldrons	—	1 wey	—	(wey)
2 weys	—	1 last	—	(last)
21 chaldrons	—	1 score	—	(scr)

This measure is applied to all dry goods.

N. B. Eighteen inches and a half wide, & eight inches deep, is the standard bushel.

In 80 loads, 2 quarters and 3 bushels of corn, how many pints?

A. 206016 pints.

Bring

APPENDIX.

51

Bring 120460 half-pints of corn into loads.

A. 23 loads, 21 bushels and 3 quarts.

In 810 chaldron of coals, how many loads?

A. 1080 loads.

In 20 lighters of coals, each 2000 bushels, and 56 boat loads, each $6\frac{1}{2}$ chal. drons, how many loads?

A. 1966 loads and 22 bushels.

TIMBER MEASURE.

64 quarter's make 1 solid inch $\left\{ \begin{array}{l} \text{grs} \\ \text{in} \end{array} \right\}$ marked

1728 inches — 1 solid foot — (ft)

27 feet — 1 yard — (yd)

50 feet — 1 load — (ld)

40 feet — 1 tun — (tun)

In 31 loads, 22 feet, how many solid inches?

A. 2716416 solid inches.

Bring 2716416 solid inches into loads.

A. 31 loads and 22 feet.

In

In 42 sticks of timber, each 4 tons 17 feet, how many solid quarter inches?

A. 822140928 solid quarter inches.

In 50 lots of timber, each 120 loads 17 feet, how many lots, each 16 tuns?

A. 470 lots, and 50 feet over.

LAND AND SQUARE MEASURE.

144 inches make 1 foot marked (in ft)

3 feet — 1 yard — (yd)

30 $\frac{1}{4}$ yards — 1 pole — (p)

40 poles — 1 rood — (rd)

4 rood — 1 acre — (ac)

640 acres — 1 mile — (mi)

Also.

100 feet — 1 square flooring (sq)

272 $\frac{1}{2}$ feet — 1 rod — (rd)

By this measure are measured all things that have length and breadth; such as land, painting, plaistering, flooring, thatching, plumbing, glazing, &c.

In 84 acres, 1 rood, 30 poles, how many poles?

A. 13510 poles.

Bring

APPENDIX.

53

Bring 427168 poles into acres.

A. 2669 acres, 3 roods, and 8 poles

In 7 fields, each 417 poles, how many acres?

A. 18 acres, 0 roods, and 39 poles.

How many rod of brick work are 9801 feet?

A. 36 rods.

WOOL WEIGHT.

7 pounds makes	1 clove marked (lb clo)
2 cloves —	1 stone — (st)
2 stone —	1 tod — (tod)
6½ tods —	1 wey — (wey)
2 weys —	1 sack (sk)
12 sacks —	1 last (last)

In 5 tods, 1 stone, and 1 clove of wool, how many pounds?

(A. 161 pounds)

In 161 pounds of wool, how many tods?

(A. 5 tods, 1 stone, and 1 clove.)

(in) — — — — — BREAD

APPENDIX.

BREAD WEIGHT.

lb. oz. dws.

A peck loaf weighs 17 6 2

Half peck 8 11 1

Quartern 4 5 8

HAY WEIGHT.

A truss weighs 56 pounds.

A load contains 36 trusses.

A tun contains 40 trusses.

In 504800 trusses of hay, how many
tuns?

A. 12620 tuns.

In 12620 tuns of hay, how many trusses?

A. 504800 trusses.

In 500 tuns of hay, how many loads?

A. 555 loads and 20 trusses.

MEASUREMENT.

60 seconds make 1 minute marked (")

60 minutes — 1 degree — (°)

15 degrees — 1 hour — (h)

30 degrees or 2 hrs 1 sign — (s)

12 signs or 360 degrees } 1 circle — (cir)

Reduce 13 circles, 5 signs, 1 hour, 12 degrees, 14 minutes, 15 seconds into thirds.

A. 1049163300 thirds.

Bring 1049163300 thirds into circles.

A. 13 circles, 5 signs, 1 hour, 12 degrees, 14 minutes and 15 seconds.

Two places situated under the equinox, when 'tis 8 o'clock in the morning at the westmost, it is half past 5 o'clock in the evening at the eastmost, how far are they asunder?

A. 8550 miles.

Two places situated as above 3825 miles asunder, when it is noon at the eastmost, what is it o'clock at the westmost; and when it is noon at the westmost, what is it o'clock at the eastmost?

A. When it is noon at the eastmost, it is $\frac{1}{2}$ past 7 in the morning at the westmost; and when noon at the westmost, it is $\frac{1}{2}$ past 4 o'clock in the afternoon at the eastmost.

T I M E.

60 seconds makes 1 minute marked (s)

60 minutes — 1 hour (hr)

24 hour — 1 day (day)

7 days — 1 week (wk)

4 weeks — 1 month (mth)

12 months 1 day } 1 year nearly (yr)

6 hours or 365 days 6 hours }

In 72 years, 2 months, 1 week 6 days

how many minutes, allowing the year to

be 365 days 6 hours?

A. 37968480 minutes.

Bring 14200920 minutes into years.

A. 27 years.

How many minutes elapsed between the

2d of May at 8 o'clock in the morning,

1778 and the 4th of July 1780, at 3

o'clock in the afternoon?

A. 143780 minutes.

THE SINGLE RULE OF
THREE DIRECT.

Teatheth by *three* numbers given to find a *fourth*, which will bear a just proportion to the *third*, as the *second* does to the *first*. Also direct proportion is, when more requires more, or less requires less; that is, when the *third* number is greater than the *first* and requires greater than the *second*; or when the *third* number is less than the *first* and requires less than the *second*.

TO STATE THE QUESTION.

R U L E.

Read the Question to find what is demanded, make the *second* number of that name; the *first* what that commands or is equal in value to it, and the *third* what governs the demand or answer required.

N. B.

N. B. The question being stated, bring the *first* and *third* numbers into one denomination, or name (when not so) and reduce the *second* number to the lowest denomination it is given in; then multiply the *second* and *third* numbers into each other, and divide that product by the *first*, the quotient will be the answer to the question in the same denomination as the *second* number was left in, and should there be a remainder (to find its value) multiply it into the next inferior denomination to the quotient and divide that product by the former divisor.

A THEOREM.
In four proportional numbers or quantities the product of the two extremes is equal to the product of the two means, that is, as 2 is to 6 so is 4 to 12; here 2 multiplied by 12 is equal to 6, multiplied by 4 equal to 24; for 2 and 12 are the two extremes, and 6 and 4 the two means.

4 equal

IN OTHER WORDS.

The first antecedent multiplied into the second consequent, is equal to the product of the first consequent, multiplied into the second antecedent; for 2 and 4 are antecedents, and 6 and 12 consequents, therefore $2 \times 12 = 6 \times 4 = 24$.

By this theorem are questions in the Rule of Three proved.

N. B. The proportion that numbers or quantities bear to each other is called the ratio.

EXAMPLES.

Suppose I gave 17 shillings for a yard of cloth, what will 25 yards cost at that rate?

yd.	s.	yds.
If 1	17	25
	—	17
	—	175
	—	25
	—	2,0)42,5 shillings
	—	£. 21—5

Ans. £. 21 5 0

If 10 cwt. of sugar cost 33l. 6s. 8d.
what cost $3\frac{1}{2}$ cwt?

cwt.	l.	s.	d.	cwt.
If 10	33	6	8	$3\frac{1}{2}$
2	20			2
20	666			7
	12			

8000 pence

2,0) 5600,0

12) 2800 pence

2,0) 23,3—4

L. II 13 4

Ans. L. II 13 4

What must I give for 5 lb. of butter,
at 7 $\frac{1}{4}$ d. per lb?

A. 3s. 1 $\frac{1}{4}$ d.

How

APPENDIX.

61

How many lbs. of butter will 3s. 1½d. purchase, at 7½ per lb?

A. 5 pounds.

What does 3 cwt. of sugar come to, at 9½d. per lb?

A. 13l. 6s.

What quantity of sugar will 13l. 6s. purchase, at 9½d per lb?

A. 3 cwt.

How many dozen of marbles will a crown purchase, at 8 for a halfpenny?

A. 80 dozen.

Bought 3lb. 5oz. 15dwts. of plate for 11l. 9s. 7½. what gave I per ounce?

A. 5s. 6d.

Cloth at 5s. 8d. per yard, what is that per ell English?

A. 7s. 1d.

Cloth at 18s. 3d. per ell Flemish, what is that per yard?

A. 1l. 4s. 4d.

If $48\frac{1}{2}$ ells English cloth cost 19l. 3s. 11 $\frac{1}{2}$ d. what is that per yard?

A. 6s. 4d.

How many apples will three half guineas purchase, at 5 for a penny?

A. 1890 apples.

What comes 25 fitches of bacon to, each $57\frac{1}{2}$ lb. at the rate of $3\frac{1}{4}$ lb. for 1s. 7 $\frac{1}{4}$ d?

A. 32l. 18s. 10 $\frac{1}{4}$ d.

What sum will purchase 20 fields, 12 of 7 acres, 116 pls. and 8 of 6 acres, 20 pls. at 10l. 13s. 4d. per acre?

A. 1511l. 9s. 4d.

If two oranges and an half cost 1 $\frac{1}{4}$ d. what cost five thousand and five?

A. 10l. 8s. 6 $\frac{1}{2}$ d.

Bought 840 pair of silk hose for 12s. 6d. per pair, and sold them again for 13s. 9d. per pair, what did I gain thereby?

A. 52l. 10s.

Sold

Sold 120 reams of paper, at 13s. 9d. per ream, and gained 7l. 10s. thereby, what did it cost me per ream?

A. 12s. 6d. per ream.

Bought 255 hds. of port for 3130l. 13s. for 128 thereof I gave 12l. 16s. per hd. what did I give per hd. for the remainder?

A. 11l. 15s. per hoghead.

108 Workmen are to have 1s. 5½d. per day each, what is their pay for 17 weeks, Sundays excepted?

A. 791l. 15s. 6d.

Bought 60 hogsheds of port wine for 14l. 3s. 6d. per hoghead, what quantity of water must be added to it, to reduce the prime cost of it to 3s. 9d. per gallon?

A. 756 gallons.

THE RULE OF THREE INVERSE.

Teacheth by *three* given numbers, to find a *fourth* in such proportion to the *second*, as the *third* is to the *first*, in an inverted order; consequently the less the *third* number is in respect to the *first*, the greater will the *fourth* number be in proportion to the *second*. Also Inverse Proportion is, when more requires less, or less requires more; that is, when the *third* number is greater than the *first*, and requires less than the *second*; or when the *third* number is less than the *first*, and requires greater than the *second*.

RULE.

State the question, and prepare the numbers as in direct proportion; then mul.

multiply the *first* and *second* numbers together, and divide that product by the *third*, the quotient will be the answer to the question, in the same denomination as the *second* number.

EXAMPLES.

If I lend my friend 100l. for 6 months, how long ought he to lend me 75l. to return the kindness?

$$\begin{array}{r}
 \text{£.} \quad \text{months} \quad \text{£.} \\
 \text{If } 100 \quad \text{---} \quad 6 \quad \text{---} \quad 75 \quad \text{---} \\
 \quad \quad \quad 100 \quad \quad \quad \\
 \quad \quad \quad \text{---} \quad \quad \quad \\
 \quad \quad \quad 75)600(8 \text{ months} \\
 \quad \quad \quad \underline{600}
 \end{array}$$

A. Eight months.

If 40 men can perform a piece of work in 14 days, how long will 28 men be doing the same in?

If

men		days		men
If 40	—	14	—	28
		40		
		—		
		28)560(20 days		
		56		
		—		
		0		

A. 20 days.

If 20 men can mow 510 acres of grass in 16 days, working 12 hours per day, in what time would they have mowed it had they worked 16 hours per day?

A. 12 Days.

Of what length must a board be that is 5 inches broad to be equal in area to one 15 inches long and 9 inches broad.

A. 27 inches.

If a piece of grass will graze 39 oxen 12 days, how many must be turned out that it may last the remainder 13 days?

A. 3 oxen.

If

If 7 yards and a half of cloth that is 1 yard three quarters wide will make a cloke, how much shalloon will line it that is 3 quarters wide ?

A. 17 yards and a half.

A garrison has provision enough to serve 5126 men 212 days, how long would it serve if re-inforced with 1280 regulars.

A. 169 days.

If the six-penny half-penny-loaf, when wheat is 4 shillings and 6 six-pence per bushel, weighs 15 ounces, 9 pennyweights, what ought it to weigh when wheat is 5s. 3d. per bushel.

A. 44 ounces, 2 dwts.

How many yards of linen, ell wide, are equal to 50 yards of linen that is a yard wide ?

A. 40 yards.

T H E E N D.

At the AUTHOR's House,
IN PARADISE-ROW, CHELSEA,
SIX GENTLEMEN

May be genteely boarded, and expeditiously taught
NAVIGATION, GEOGRAPHY,


The Use of the Globes,
NICVM

With every necessary Qualification for the
SEA OFFICER,
COMPTING-HOUSE, PUBLIC OFFICES,
AND TRADE.

MR. BETTESWORTH enjoys this Advantage, he was
Seven Years in the ROYAL NAVY, and there taught
NAVIGATION both *theoretically* and *practically*. Any Gentle-
man whose Time will not admit of learning a regular
System thereof, may be instructed to navigate a ship to
any Part of the known World in a few Weeks; he was
regularly brought up to the Profession, and has for many
Years been engaged in Educating Youth: flatters himself
those (being few in Number) intrusted to his Care, will
have very great Advantage over any educated at Public
Schools, and in much less Time may be qualified ac-
cording to their Desire.

